The Development of a Final Year Project Management System for Information Technology Programmes

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Abstract. This project tries to develop an online platform which facilitates the final year projects (FYP) process implemented by our information technology programme. The whole FYP is a year-long process involving groups of students and their supervisors to accomplish a theme based project. It is very necessary to employ the latest technologies in order to allow different parties to contribute and communicate more efficiently. Therefore, we have designed and developed a comprehensive web-based system to better support the three kinds of users; they are the FYP programme organizer (PO), project supervisors and the project group members.

Before the academic year starts, PO will have to assign project topics according to the preferences and academic record of the formed project groups. This is a tedious and error prone task to manually complete the allocation of projects. The system is therefore useful to help PO to arrange project selection and allocation procedure, as well as helping the students to submit their preferences and group member information. During the academic year, the system would provide different functionalities for the PO to collect student's assessments and markers' scores via the submission and grading module.

Project supervisors will also be able to employ the system for keep tracking the progress of the projects with the use of the project management tools, and online chat function. Both the students and supervisors will be benefited from these functionalities and allow the project to run more smoothly even face-to-face meetings are not held very frequently.

Project group members themselves are provided with similarly effective communication tools to allow easy of discussion on project issues among members. Moreover, they can share resources about the project including source code and data files using our online repository

Keywords: project management, online communication, team work, project supervision, final year project.

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1 Introduction

In most of the curriculums in information technology (IT) undergraduate programmes, it is common that students are expected to complete a comprehensive software development project in their final year studies. That is also why it is usually known as final year project (FYP). This project based study aims to provide an integrated training on their team working skill, technical knowledge learnt from different courses, and project management skill.

In the IT degree programme offered in Caritas Institute of Higher Education, this project based course is delivered throughout 2 semesters in the fourth year of the study. Students are grouped to work on a project under the supervision of a professor. Before the semester starts, students are required to form groups of three, and involve in a project allocation process. The project allocation process is trying to match the interest of student to expertise of the professor. Each group of the students can choose their favorite project topics which are proposed by professors, and the allocation will help to resolve any conflict in the choices between groups based on their academic records in last year. Therefore, each project group will be assigned with a theme to work when the semester starts. Apart from prototyping the software according to the project theme, students are required to have meetings with supervisor, hand in project proposals, progress report and carry out presentation of their completed works throughout the whole academic year. As a result, both the supervisor and the students have to work closely, face challenges and deadlines when finishing the project.

As the first implementation of the FYP in Caritas began two years before this paper is written, many of the processes are carried manually and highly rely on traditional ways for communication and assessment submission. For example, in project selection and allocation, students have to form group and choose their favorite project topics by filling in forms on paper. Programme Organizer (PO) will collect all these hardcopy forms and start the project allocation manually. It can become a tedious and time consuming task when the number of groups arrived 20 or more. Moreover, the assignment of projects requires sorting out the priorities of groups based on their average GPA, and this sorting must be done very careful in order to have a fair result, as conflict of choices between groups will always occur and priority do affect the final assignment. Apart from the project allocation, many of the deliverables from the project are submitted via hardcopy or email. Although the FYP is supported by a course management system similar to other courses delivered in the institute, it is not very well suited for a project or group based works submission.

To keep track of students' progress, supervisors usually meet students in a weekly or biweekly basis. However, as supervisors commonly have to mentor three or more groups in a year, a face-to-face meeting has to be limited to as short as an hour or half, or even lesser. Students will just have enough time to report their progress and setup goals for the coming weeks during the meeting. It does not allow students and supervisors to discuss or solve challenges when the project encounters problems. It is kind of hard for students to communicate with their supervisor out of the meeting time purely by email, as the feedback time is prolonged, and progress of the project will be significantly affected. In addition, students usually found it difficult for them to keep up the original planned progress after the project starts. This can due to the

lack of project management knowledge and tools, their busy schedule during the semester, and poor management of their prototype's source code and files.

To overcome the various problems encountered during the implementation of the FYP in the previous years, we decided to develop our own final year project management system to serve the whole process. Figure 1 lists a number of procedures in the FYP and the corresponding system module to facilitate that procedure. First of all, the project allocation module provides a web-based interface for students to form groups and select favourite topics, supervisors to promote their project themes and PO to automatically complete the project assignments. As all the selections are kept in the online database, PO can easily manage the information without keeping hardcopy forms. In addition, the project allocation is performed by the system; this reduces the chance of mistakes in the assignment.

Our system also consists of modules for assessment submission, project management, members' communications and sharing. Deliverables of the project like proposal, reports and presentation slides can be uploaded to the system in a submission per group manner. Instant chat module helps students and supervisors to communicate and discuss problems faced in any time and places. A task management tool is provided for students to record tasks to be completed and keep track of finished tasks in the next meeting. Finally, the management and sharing of deliverables and source codes among group members can be done effectively with the file sharing and repository module. All of these modules in the system facilitate the whole FYP to run more smoothly and efficiently, reduce miscommunication and mistakes to happen as well.

In the following of this paper, we will give a short review of similar systems from other institutes or parties, and then we will focus on the introduction of every module in our system in detail. Finally, we will present a preliminary evaluation of the system through a small scale user study about the current prototype system.

Fig. 1. Overview of the FYP procedures and related system functionalities from the point of view of students

2 Related Works

Our FYP management system is similar to a typical course management system (CMS), or a project management system. The comprehensive comparisons of CMS had been made by various parties like [1] and [2], especially the two commonly employed systems: Moodle [3] and Blackboard [4]. ClockingIT is a general project management system with licensing free of charge [5]. It provides basic management

function like task management with priority assignment to tasks, so that project manager can better arrange manpower and plan the schedule of project. Moreover, it has chat function and forum for ease of communication, while at the same time, it provides share folders for user to access documents and source code simultaneously. This system also included some advanced functions like Gantt chart generator which is a standard tool for project scheduling.

Clement and Bounds shared similar goal as our system in facilitating the management of FYP [6]. While, their focus was to better connect students with potential supervisors before the project allocation starts. Their system also included tools for assessment submission and collection which are normal functions in a CMS. Bakar et. al. had reported their experience in developing and using an FYP management system at Universiti Kebangsaan Malaysia [7]. Their system consists of three major modules including user profile, project monitoring and appointment setting modules. Our system also contains similar functional modules as Barkar's, while we have additional modules like project allocation, file repository and online communication. The HKU CS Project Management System is a project management system that developed in the University of Hong Kong, Department of Computer Science [8]. The system can show project information, news, schedules and project allocation. In the main page of this system, it includes functions like blogs, calendar and forms downloading. Also, there is a list of projects and related information, as well as some advanced function like providing a virtual machine for students as servers for their FYP.

3 System Overview

Our system is divided into five modules based on their functionalities; they are project allocation module, communication module, project management module, file sharing & repository, and submission & grading module. These modules are useful for different parties involved in the FYP, they are the Programme Organizers (PO) or Administrator, Supervisor/Marker and Students.

Before the beginning of a year, PO will use the project allocation module to create all users' accounts and make it ready for supervisors to input their proposed project themes. Later, students can form groups and select project topic through the project allocation module. Before the start of the first semester, PO will allocate projects to each group of students by the automatic allocation function provided, and students will be informed via the system.

When the semester starts, students and supervisors are supported by the system with functions like task management, file sharing, and instant chat and discussion. Finally, students have to submit deliverables like proposals or reports by uploading to the submission and grading module. Marker and supervisors will be notified and insert their score to each project after review.

In the following of the paper, we will have more detail discussions on these five modules individually.

4 System Functionalities and Implementation

4.1 Project Allocation Module

Group formation and project selection are the first two steps the system helps the students as shown in Figure 1. These processes are done manually before by submitting paper forms to the PO. Students can use their accounts on the system to submit invitation to peers to form a group, as shown in Figure 2a. When the invited partners confirmed the group formation, the system will automatically recognize the members as a group and allow the group to select their preferred project themes. In Figure 2b, a group can choose three favorite projects from the list of available themes as shown in the interface in Figure 2c. These project themes are prepared and input beforehand by the supervisors to the systems as in Figure 2d. As a result, PO is not necessary to collect all the project themes from supervisors and announce them to the students as before. The system leverages the workload to PO and significantly reduces the paper works involved.

An important feature provided by the project allocation module is the automatic assignment of projects according to the academic records of students and the preferences from students and supervisors. The mechanism of assigning project theme to a certain project group is illustrated in Figure 3. Project group with a higher average academic record in the past years, only GPA is considered in our current implementation, will have a higher priority in selecting a project theme. As a result, by looping through all the available groups from the highest to lowest GPA, then assign project theme to the group based on their preference list will solve the problem of assignment.

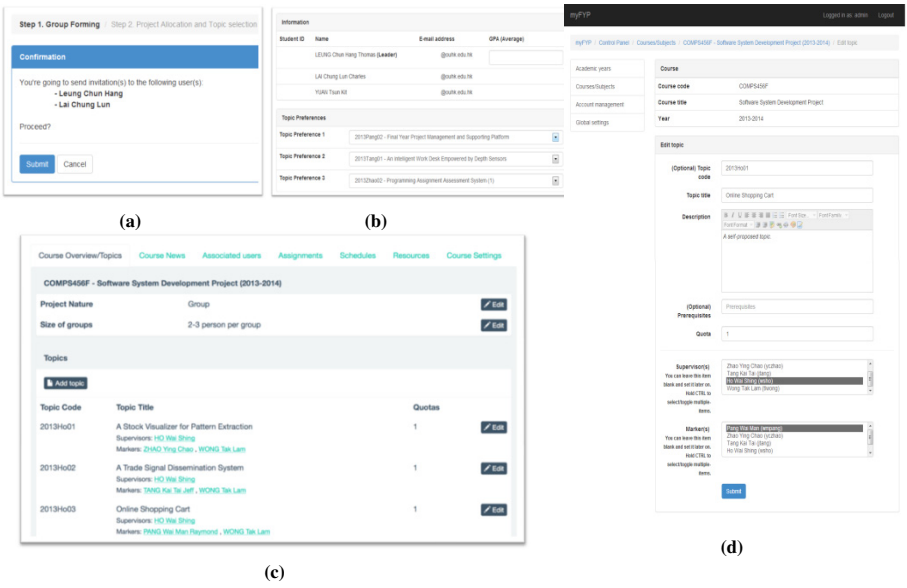

Fig. 2. User interface for **(a)** group formation, **(b)** project selection, **(c)** listing of projects available for selection, and **(d)** project theme creation by supervisor

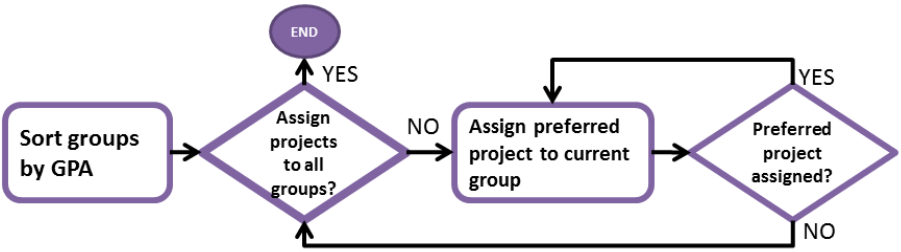

Fig. 3. Mechanism in processing the group assignment

However, when a group has all three preferred projects occupied by other groups already, this creates a problem in deciding which project should be assigned to this group. Our current implementation will try not to resolve this problem and leave these groups unassigned with a project theme in this stage. Groups without any project assigned in the first stage will have a chance for project selection in the second stage of assignment.

There may appear groups with the same GPA, and compete on the same project theme. This kind of conflict is problematic, as a random assignment to a specific group may create cascading effects to the assignments afterwards. For example, we have 3 groups A, B and C with their preferred projects P1 to P4 as shown in Figure 4a.

We see that as Group A and B have higher GPA than Group C, they can match for favorite projects first. However, as both Group A and B have chosen P1 as their first preference, and they have same GPA 3.5. This will cause a conflict between them. A simple random assignment of P1 to either one of them can cause very different overall assignment result due to the cascading effect as shown in Figure 4b and 4c. It is because each assignment is not always independent.

As in our example, if P1 is assigned to Group A, Group B surely has to match with its second preference P3, Group C is left unaffected in this case, and can be assigned with its first preference P2. However, the result can be totally different if P1 is assigned to Group B instead. We can see that Group A is now assigned to P2 which is the first preference of Group C. In this case, Group C can only match to its second preference P3 as shown in Figure 4c.

To avoid similar unexpected effect on the assignments, our system will prompt PO about this kind of tie situations, and stop further processing more assignments. We will rely on PO to resolve the conflict first before further processing, but it is rare to have groups with same average GPA and it should not cause much workload to PO.

Our system provides user-friendly interface for the PO to perform the mentioned assignment. In Figure 5a, PO can perform the assignment at any time he/she wants by just press a single button, and view the result immediately. When conflict occurs, the system will raise the problem as shown in Figure 5b to PO and ask for resolution from PO.

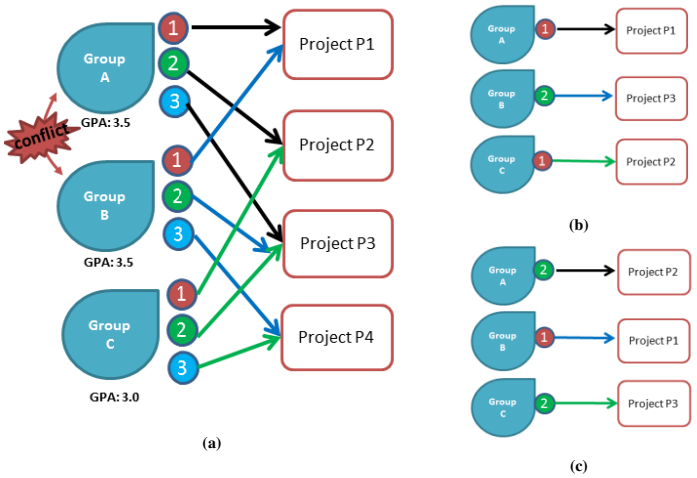

Fig. 4. (a) A sample scenario of final project assignment with three groups (A-C) and four projects (P1 – P4), each group have 3 preferences labeled and pointing to the projects. In this scenario, conflict occurs because Group A and B have same GPA. **(b)** Result of resolving the conflict by assigning P1 to Group A. **(c)** Result of resolving the conflict by assigning P1 to Group B instead. We find that the result of (b) and (c) are different and even affecting Group C.

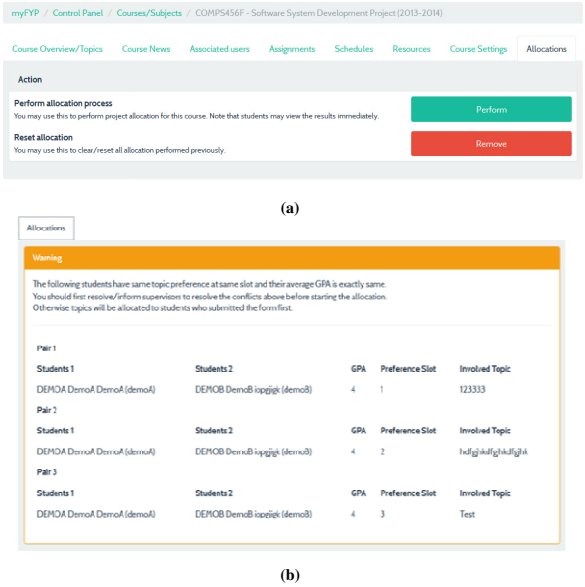

Fig. 5. (a) Administrators can start the allocation process manually through the page above. **(b)** Conflicts have to be solved when two groups are having the same priority in choosing the same project

4.2 Communication Module

Since our final year project is a group based one, communication between members and supervisor is an important issue for the success of the project. Our current channel of communication between supervisor and students mainly relies on the weekly or biweekly regular face-to-face meeting. However, as supervisor usually has limited time spending on the meeting, students are usually difficult to learn or discuss problem with their supervisor when working on the project. This can affect both the progress of FYP and the efficiency of the students in learning new technologies.

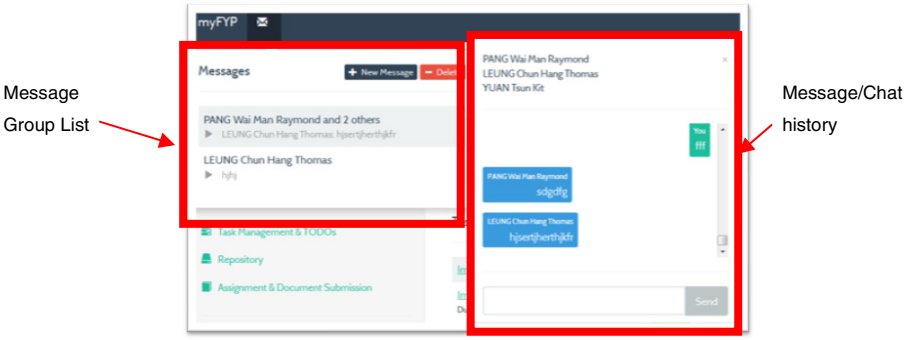

Fig. 6. Chat and messaging functions provide to group members and supervisors to communicate online

As a result, the communication module provides a new and convenient channel for meeting and discussion between project members and supervisors. Figure 6 shows the chat and messaging functionalities which are provided for students to discuss among themselves or ask questions to their supervisor. As message will be left on the system, either party can reply at any time or anywhere. It can provide extra time for discussion and reduce the time for finding each other.

Comparing to e-mail, messages on the system are much clearly organized and will not be overwhelmed by their already cluttered mailbox. It is because messages history can be referenced easily, and only group members can see the discussion.

Moreover, the real-time chat allows meeting to be held flexibly at any time that is convenient for all members and skip traveling time. Supervisor can also hold meetings at the same time with multiple groups and interleaving to response to questions from different groups at the same period of time, this can save time in meeting and become more efficient in communication.

4.3 Project Management Module

Apart from the communication issues, it is essential for all members to have a clear target or goal to accomplish during the development of the project. As both students and supervisors are always busy on the course works, teaching and learning during the semester, in order to keep up the momentum of working on the project, project management tool is useful.

Our current project management module includes a task management tool to help students in keeping their schedule. Students can create and edit tasks on their scheduler by directly selecting the deadlines as in Figure 7. Each task in this TODO list can be assigned with a priority to help students sorting out the completion order of their tasks in hand. It is also very useful in facilitating the discussion and progress checking in the regular meeting between supervisor and students.

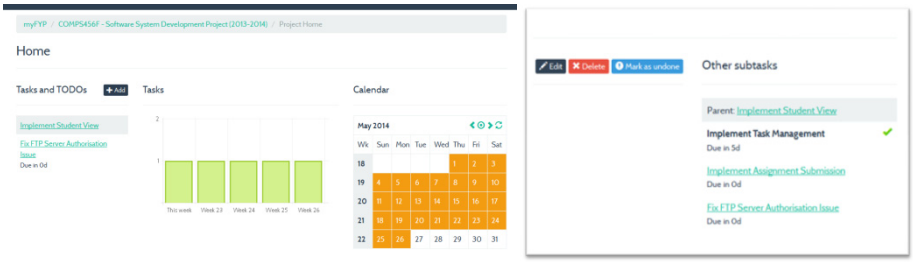

Fig. 7. Student can create tasks on the scheduler and plan for a reasonable completion date of project milestones. Therefore, students can keep track of their progress more easily.

4.4 File Sharing and Repository Module

During the development of a final year project, it is required that group members to divide workload among themselves, so that each of them will be responsible to implement only part of the prototype. Therefore, it is very necessary for them to share source code, documents and other important resources related to the project. Our current students will rely on some cloud resources in public domain or their own storage device to exchange these important data among themselves.

As a result, our system was designed to provide file sharing function for the project groups to share source code or other resources among group mates and their supervisor. This file repository provides a more secure and centralized place for them to keep their produced works. Supervisor can easily access students' work and keep track of the progress by directly viewing the shared deliverable of the project. Figure 8 displayed the web interface when accessing the repository, only member of the project will be able to access the files in the repository and share among themselves.

4.5 Submission and Grading Module

At the end of the semesters, our FYP programme will require students to report their results of the project by preparing the system prototypes and reports. They can now submit the assessments to the system (see Figure 9a), instead of sending them to PO by email before. PO can easily check all the submission status of the groups (see Figure 9b), and obtain all the deliverables by simply download from the system.

Apart from relieving the workload of PO in collecting the assessments, markers can easily download the report, review and provide score all through the system via interface in Figure 9c.

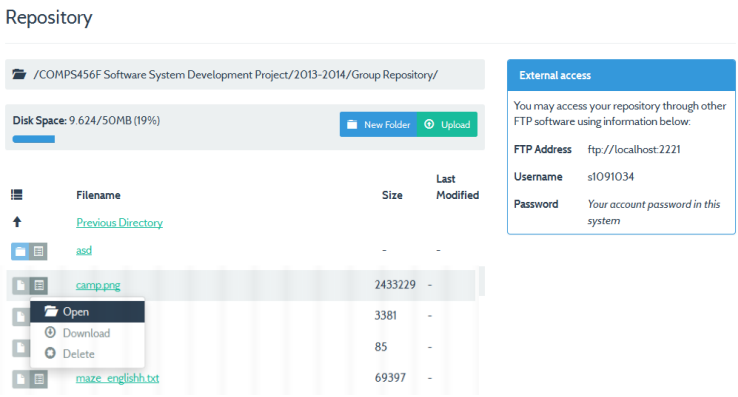

Fig. 8. File sharing and repository module provides a web interface for uploading, storing and sharing of project related resources like source code, documents, images and etc

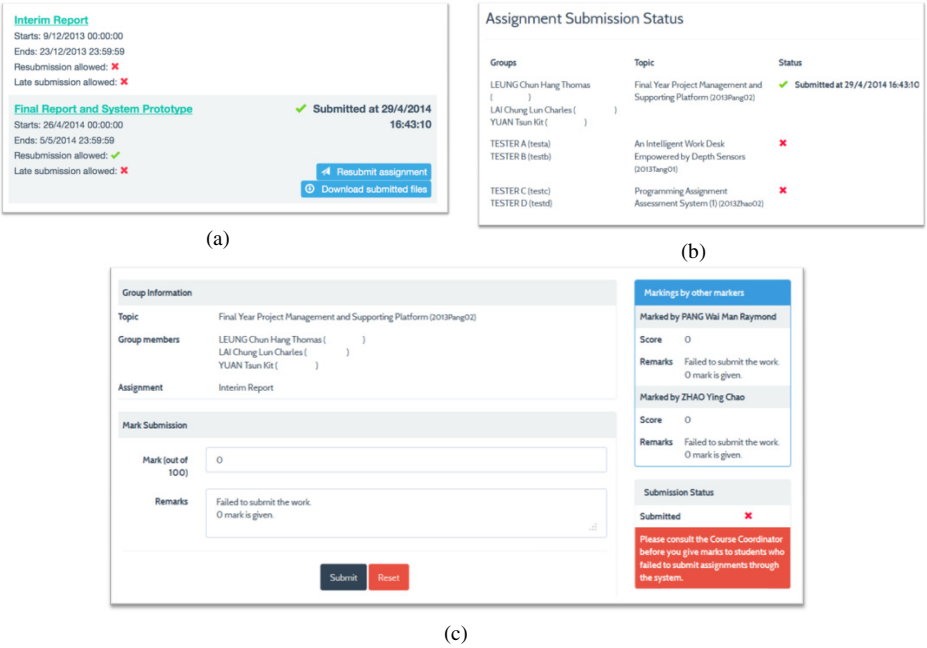

Fig. 9. User interfaces of the Submission and Grading Module. (a) Student can submit assessment. (b) PO can instantly check the submission status of all groups. (c) Markers can grade each assessment online.

5 Preliminary User Study and Evaluation of the System

To better understand the strength and weakness of our system, we have performed a preliminary study by interviewing thirteen students who are in their third or fourth year's study. They are asked to try using all modules of the system, and then complete a questionnaire after the trial. The 10 questions are all yes or no questions. Some of these questions and the response are shown in Figure 10.

Most of the responses are positive to our system, including the ease-of-use of the system and certain functions. Also, over 70 percent of the users think the system is convenient and willing to switch to the system.

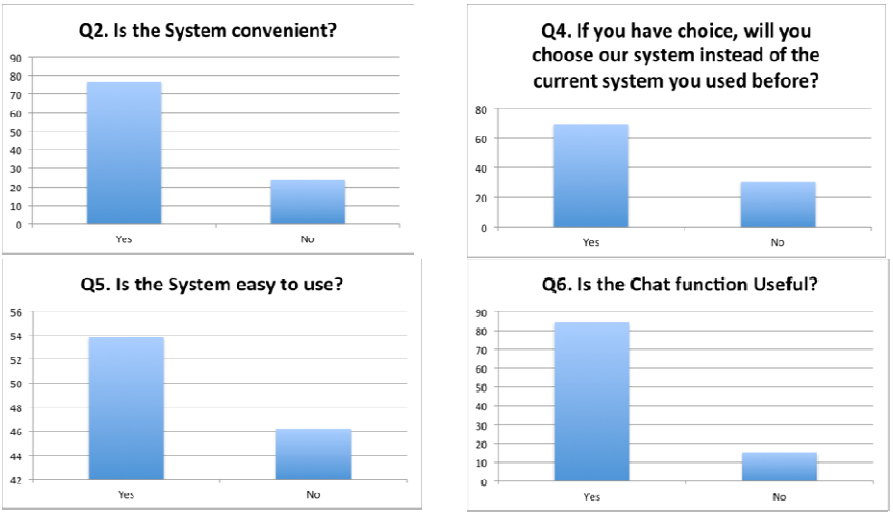

Fig. 10. The result of a preliminary user study on our system by interviewing thirteen students. Results are presented in percentage.

6 Conclusion

We presented a specific system tailor to facilitate the implementation of the final year project in our IT programme. The FYP management system can significantly reduce the workload of programme organizer. Lots of arrangement, announcement and assessment collection tasks can be done automatically in the system. At the same time, our system provides convenience for supervisor and students throughout the process of FYP. First, supervisors and students can better communicate via the chat and messaging tools in the system. Supervisor can also easily keep track of the progress of students with the project management module and file sharing functions. Finally, supervisors and markers can quickly manage to obtain the deliverables of the project and provide grades on the system.

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